IBM Tivoli Storage Manager for Databases
Data Protection for Oracle

Version 7.1.3
for Windows

Installation and User's Guide

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Note:
Before you use this information and the product it supports, read the information in "Notices" on page 51.

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This edition applies to version 7, release 1, modification 3 of IBM Tivoli Storage Manager for Databases: Data Protection for Oracle for Windows (product number 5608-E04) and to all subsequent releases and modifications until otherwise indicated in new editions.

Contents

About this publication

This publication contains information about installing, configuring, administering, and using IBM® Tivoli® Storage Manager for Databases: Data Protection for Oracle.

Data Protection for Oracle runs online or offline backups of Oracle 11g databases to Tivoli Storage Manager storage. This integration with the RMAN Media Management API maximizes the protection of data, and provides a comprehensive storage management solution.

Tivoli Storage Manager is a client/server licensed product that provides storage management services in a multiplatform computer environment.

Who should read this publication

The target audience for this publication includes system installers, system users, Oracle database administrators, Tivoli Storage Manager administrators, and system administrators.

It is assumed that you have an understanding of the following applications:

- Oracle server
- Tivoli Storage Manager server
- Tivoli Storage Manager backup-archive client
- Tivoli Storage Manager application programming interface

It is assumed that you have an understanding of the Windows Server operating system on which your Oracle database is hosted.

Publications

The Tivoli Storage Manager product family includes IBM Tivoli Storage FlashCopy® Manager, IBM Tivoli Storage Manager for Space Management, IBM Tivoli Storage Manager for Databases, and several other storage management products from IBM.

To view IBM product documentation, see http://www.ibm.com/support/knowledgecenter.

New for 7.1.3

The documentation has been updated to include information from APARs.

Language packs merged into the base package

In earlier updates, the language packages were installed separately. Starting with this update, the language packages are merged into the base package. Because the file merge is handled programmatically, there are no specific instructions related to this update. After the installation process is complete, like the base package, the languages are signed in the Windows registry.

Estimate compliance with license entitlements

From the Tivoli Storage Manager Operations Center, you can view front-end and back-end capacity usage to estimate compliance with license entitlements.

Important: The Tivoli Storage Manager client software needs to be at the latest level for the Operations Center to present complete data.

Chapter 1. Data Protection for Oracle

A brief overview of IBM Tivoli Storage Manager and IBM Tivoli Storage Manager for Databases: Data Protection for Oracle is provided.

Tivoli Storage Manager overview

Tivoli Storage Manager is a client/server program that provides storage management services in a multi-vendor, multi-platform computer environment.

Tivoli Storage Manager provides these functions:

- Reduces network complexity

  Tivoli Storage Manager reduces network complexity with interfaces and functions that span network environments. Consistency across different operating systems and hardware is provided.
- Increases administrator productivity

  Tivoli Storage Manager can reduce the cost of network administration by allowing administrators to:
  - Automate repetitive processes.
  - Schedule unattended processes.
  - Administer Tivoli Storage Manager from anywhere in the network.
- Reduces the risk of data loss

  Many users do not back up their data. Other users apply stand alone backup techniques with diskettes and tapes as the only protection for business data. These backup systems often produce disappointing results during recovery operations. Tivoli Storage Manager schedules routine backups that enable users to recover from accidental data deletion without administrator involvement.
- Optimizes existing storage resources

  Tivoli Storage Manager allows users to move files from client file systems to Tivoli Storage Manager storage. This optimization saves space on client file systems and can eliminate the expense of upgrading client storage hardware.

  Tivoli Storage Manager monitors client storage space and moves files from client file systems to Tivoli Storage Manager storage if an out-of-space condition threatens. This function can also eliminate the expense of client hardware upgrades.

Tivoli Storage Manager provides these services:

- Backup and restore services

  These services generate backup copies of data at specified intervals, and restore the data from these copies when required. The services protect against workstation or file server media failure, accidental file deletion, data corruption, data vandalism, or site disasters.
- Archive and retrieve services

  These services provide backup-archive clients with point-in-time copies of data for long-term storage.
- Server hierarchical storage management services

These services migrate client files from expensive storage media to less expensive storage media, for example from disk to tape. Administrator-defined thresholds determine file migration for each storage pool. Migration applies to all backup and archive client files.

- Automation services

  Tivoli Storage Manager administrators can increase productivity by automating common storage administration tasks.

- Administration services

  Tivoli Storage Manager administration services provide support for routine monitoring, administration, and accounting. Administrators can manage the server from another system or the same system. The Tivoli Storage Manager utilities allow the administrator to:

  – Set client and server options.
  – Define devices.
  – Format storage volumes.
  – Add more clients.
  – Label tape volumes.

  Tivoli Storage Manager monitors scheduled operations and maintains status information in the database. An administrator can export data to removable media. This data can be imported by another server, making the export and import features a convenient utility for moving server data. The administrator can specify the accounting option that is generated at the end of each client session.

- Security services

  Security services control user access to Tivoli Storage Manager data, storage, policy definitions, and administrative commands.

- Disaster recovery management

  Disaster recovery management helps the administrator implement a comprehensive backup and recovery procedure for important business applications, data, and records.

Overview of Data Protection for Oracle

Data Protection for Oracle interfaces with the Oracle Recovery Manager (RMAN) to send backup versions of Oracle databases to the Tivoli Storage Manager server.

Data Protection for Oracle currently supports Oracle 11g databases with the Oracle Recovery Manager. See Chapter 2, “Data Protection for Oracle installation,” on page 5 for specific levels of supported Oracle databases.

RMAN and Data Protection for Oracle

Oracle Recovery Manager (RMAN) provides consistent and secure backup, restore, and recovery performance for Oracle databases. While the Oracle RMAN initiates a backup or restore, Data Protection for Oracle acts as the interface to the Tivoli Storage Manager server . The Tivoli Storage Manager server then applies administrator-defined storage management policies to the data. Data Protection for Oracle implements the Oracle defined Media Management application programming interface (SBTAPI) 2.0. This SBTAPI communicates with RMAN and translates Oracle commands into Tivoli Storage Manager API calls to the Tivoli Storage Manager server.

You can use RMAN Data Protection for Oracle to run backup and restore functions that are listed.

- Full and incremental backup functions online or offline for:
  - Databases
  - Table spaces
  - Data files
  - Archive log files
  - Control files
- Full database restores while offline.
- Table space and data file restore online or offline.

LAN-free data transfer

Data Protection for Oracle supports backup and restore operations in a LAN-free environment. This environment shifts the movement of data from the communications network to a storage area network (SAN). Data moves over the SAN to a SAN-attached storage device by the Tivoli Storage Manager Storage Agent. Running Data Protection for Oracle in a LAN-free environment avoids constraints of the network. The load on the Tivoli Storage Manager server is decreased, allowing the server to support a greater number of simultaneous connections.

Data Protection for Oracle can be installed on a client with the Storage Agent (STA). The agents can be installed on a non-STA client. The backup data is sent over the LAN (TCP/IP) to the STA client. The STA client sends the data over the SAN LAN-free, directly to tape or disk.

In addition to specific LAN-free requirements, you must specify the following option:

lanfreetcpserveraddress
Specifies the TCP/IP address for a Tivoli Storage Manager Storage Agent.

Migration and coexistence with Data Protection for Oracle

The migration considerations to the new version of Data Protection for Oracle are provided.

- Existing backups that are created with a previous version of Data Protection for Oracle are restorable with Data Protection for Oracle 7.1.
- Backups that are created with Data Protection for Oracle 7.1 cannot be restored with previous versions of Data Protection for Oracle.

Related tasks:

Chapter 3, “Configuring Data Protection for Oracle,” on page 11

“Editing RMAN scripts” on page 24

Automated failover for data recovery

When there is an outage on the Tivoli Storage Manager server, Data Protection for Oracle can fail over to a secondary server for data recovery operations.

The Tivoli Storage Manager server that Data Protection for Oracle connects to for backup operations is called the *primary server*. When the primary server and the Data Protection for Oracle node are set up for node replication on the primary server, the node can be replicated to another Tivoli Storage Manager server, called the *secondary server*.

During normal operations, connection information for the secondary server is automatically sent to Data Protection for Oracle from the primary server. The secondary server information is saved to the client options file (`dsm.opt`) on the Data Protection for Oracle node. No manual intervention is required by you to add the information for the secondary server.

Each time Data Protection for Oracle logs on to the server for backup services, it attempts to contact the primary server. If the primary server is unavailable, Data Protection for Oracle automatically fails over to the secondary server. In failover mode, you can restore data that was replicated to the secondary server. When the primary server is online again, Data Protection for Oracle automatically fails back to the primary server the next time it connects to the server.

You can confirm that Data Protection for Oracle has failed over by looking for entries about the secondary server in the `dsierror.log` file.

Requirements: To ensure that automated client failover can occur, Data Protection for Oracle must meet the following requirements:

- Data Protection for Oracle must be at the V7.1 level.
- The primary server and secondary server must be at the V7.1 level.
- The primary and secondary servers must be set up for node replication.
- The Data Protection for Oracle node must be configured for replication with the `replstate=enabled` option in the node definition on the server.
- Before the connection information for the secondary server can be sent to Tivoli Storage FlashCopy Manager, the following processes must occur:
  - You must back up data at least one time to the primary server.
  - The Data Protection for Oracle node on the primary server must be replicated at least one time to the secondary server.

Restriction: The following restrictions apply to Data Protection for Oracle during failover:

- Any operation that requires data to be stored on the Tivoli Storage Manager server, such as backup operations, are not available. You can use only data recovery functions, such as restore or query operations.
- Schedules are not replicated to the secondary server. Therefore, schedules are not run while the primary server is unavailable.
- If the primary server goes down before or during node replication, the most recent backup data is not successfully replicated to the secondary server. The replication status of the file space is not current. If you attempt to restore data in failover mode and the replication status is not current, the recovered data might not be usable. You must wait until the primary server comes back online before you can restore the data.

Chapter 2. Data Protection for Oracle installation

Install IBM Tivoli Storage Manager for Databases: Data Protection for Oracle to protect your Oracle server databases.

Installing Data Protection for Oracle

Verify installation prerequisites and follow the instructions to install Data Protection for Oracle for Windows.

Before you begin

Hardware, software, and operating system requirements must be met before you attempt to install Data Protection for Oracle.

Installation prerequisites

Before you install Data Protection for Oracle, ensure that your system meets the minimum hardware, software, and operating system requirements.

The minimum hardware and software requirements for the Data Protection for Oracle release are available in the hardware and software requirements technote for each particular release. For current requirements, review the Hardware and Software Requirements technote for your version of Data Protection for Oracle. This technote is available in the *TSM for Databases - All Requirements Documents* website at http://www.ibm.com/support/docview.wss?uid=swg21218747. From the page, follow the link to the requirements technote for your specific release or update level.

Note:

- You cannot install the 32-bit version of Data Protection for Oracle on a 64-bit operating system.
- You must have administrative authority to install Data Protection for Oracle on a Windows server where the target database is stored.
- If Data Protection for Oracle was not previously installed on your system, you can install it to the Tivoli Storage Manager base directory. For best results, install all Tivoli Storage Manager products and components into the same base directory.
- The installation process does not overwrite the existing `dsm.opt` options file, `tdpo.opt` configuration file, or log files.

Minimum hardware requirements

Your system must meet the minimum hardware requirements for installing or operating Data Protection for Oracle in a Windows environment.

The minimum hardware requirements for the Data Protection for Oracle release are available in the hardware and software requirements technote for each particular release. For current requirements, review the Hardware and Software Requirements technote for your version of Data Protection for Oracle. This technote is available in the TSM for Databases - All Requirements Documents website at http://www.ibm.com/support/docview.wss?uid=swg21218747. From the page, follow the link to the requirements technote for your specific release or update level.

Minimum software and operating system requirements

Your system must meet the minimum software and operating requirements for using Data Protection for Oracle in a Windows environment.

Virtualization support

The minimum hardware and software requirements for the Data Protection for Oracle release are available in the hardware and software requirements technote for each particular release. For current requirements, review the *Hardware and Software Requirements* technote for your version of Data Protection for Oracle. This technote is available in the *TSM for Databases - All Requirements Documents* website at http://www.ibm.com/support/docview.wss?uid=swg21218747. From the page, follow the link to the requirements technote for your specific release or update level.

Information about the virtualization environments that can be used with Data Protection for Oracle is available in the *IBM Tivoli Storage Manager guest support for virtual machines and virtualization* website at: http://www.ibm.com/support/docview.wss?uid=swg21239546.

Installing for Windows

Use these instructions to install Data Protection for Oracle.

Procedure

With the Data Protection for Oracle DVD in the DVD drive, Windows automatically starts the InstallShield wizard. If the wizard is not enabled, complete the following steps.

1. Run one of the following commands, where *x* is the DVD drive letter:
   - (x86): `x:\oracle\windows\x32\client\setup`
   - (x86_64): `x:\oracle\windows\x64\client\setup`

   Click **OK** to start the installation program.
2. Accept the License Agreement and click **Finish** to complete the installation.

Installing in silent mode

You can install Data Protection for Oracle in silent mode. A silent installation runs independently without any intervention so that you are not required to monitor, or provide input.

About this task

This method is useful when you must install Data Protection for Oracle on a number of different computers with identical hardware. For example, a company might have 25 Oracle servers that are installed across 25 different sites. You can create an unattended installation package and make it available to the 25 sites. This method ensures a consistent configuration and avoids different people all entering Data Protection for Oracle parameters. The installation package can be placed on a DVD and sent to each site, or it can be placed on a file server for distribution.

You can install in silent mode with one of the following methods:

Setup Program
: Use the **setup** command and specify silent installation options.

Microsoft Installer (MSI)

Use **msiexec.exe** to install the package.

The following options can be used with either silent installation method.

Table 1. Silent installation options

Option	Description
/i	Specifies the program to install the product.
/l*v	Specifies verbose logging.
/qn	Runs the installation quietly, without displaying windows.
/s	Specifies silent mode.
/v	The setup passes the parameter string to the MSI executable program (**msiexec.exe**). The following syntax is required when you use the **/v** option: • Use a backslash (\) before quotation marks (" ") that are contained within existing quotation marks. • Do not include a space between the **/v** command-line option and its arguments. • Separate parameters that are entered with the **/v** command-line option with a space. • Create a log file by specifying the directory and file name after the command. The directory must exist before you start the installation process.
/x	Specifies that the program is to uninstall the product.
addlocal	Specifies features to install.
allusers	Specifies which users can use the installation package.
installdir	Specifies the directory where Data Protection for Oracle is to be installed.
reboot	Specifies whether to prompt the user to restart the system after silent installation. *Force* Always prompts user to restart after an installation. *Suppress* Suppresses prompt to restart after an installation. *ReallySuppress* Suppresses all restart operations, and prompts the user to restart after an installation.
rebootyesno	Specifies whether to restart the system after silent installation.

The following components are used in this procedure and are case-sensitive.

Table 2. Silent installation components (base client only)

Component	Description
Client	Data Protection for Oracle code
License_Paid	License file is used when paid versions of Data Protection for Oracle are installed

Installing in silent mode with the setup executable file

Use the setup program, by running the `setup.exe` file, to install Data Protection for Oracle in silent mode. When you install in silent mode, you do not need to monitor the process or provide input.

Before you begin

Install Data Protection for Oracle from an account that is a member of the local Administrators group for the computer where the Oracle server is running.

About this task

The following commands can be used for installing Data Protection for Oracle in silent mode.

Procedure

Run the following command to install Data Protection for Oracle in silent mode to the default installation directory:

```
setup.exe /s/v/qn
```

- Install Data Protection for Oracle in silent mode to the default installation directory with custom features by running the following command:

```
setup.exe /s /v"INSTALLDIR=\"c:\program files\tivoli\tsm\"
ADDLOCAL=\"Client,License_Paid\"
TRANSFORM=1033.mst /qn /l*v \"c:\temp\log.txt\""
```

In a custom installation, list all features after the **addlocal** option.

Installing in silent mode with MSI

You can install Data Protection for Oracle in silent mode by using the Microsoft Installer program (MSI), and the `msiexec.exe` file.

Before you begin

Prepare to install Data Protection for Oracle from an account that is a member of the local Administrator group for the computer where the Oracle server is running.

About this task

Important: Data Protection for Oracle installs the Microsoft Visual C++ 2012 Redistributable Package as a setup prerequisite. If you are installing the product with the `msiexec.exe` file, you must separately install the Microsoft Visual C++ 2012 Redistributable Package. The files are included in the installable packages:

- For Windows 32 bit, install the following file:

  In the path to the Data Protection for Oracle files: `\ISSetupPrerequisites\Microsoft Visual C++ 2012 Service Update 1 Runtime Libraries (x86)\vcredist_x86.exe`
- For Windows 64 bit, install the following file:

In the path to the Data Protection for Oracle files: `\ISSetupPrerequisites\Microsoft Visual C++ 2012 Service Update 1 Runtime Libraries (x64)\vcredist_x64.exe`

Procedure

The following example silently installs to a directory other than the default installation directory and includes custom features:

```
msiexec /i<path to msi file>\"IBM Tivoli Storage Manager for Databases - Oracle.msi"
RebootYesNo="No" Reboot="Suppress" ALLUSERS=1
INSTALLDIR="c:\program files\tivoli\tsm"
ADDLOCAL="Client,License_Paid"
TRANSFORM=1033.mst /norestart /qn /l*v "c:\temp\log.txt"
```

Capturing a log of the installation

Capture a log of the installation of Data Protection for Oracle using the following procedure.

About this task

The following environmental information can be helpful:

Gather a detailed log of the installation procedure in a file called `setup.log`. To gather the information, run the setup program as follows:

```
setup /v"/l*v setup.log"
```

Creating an installation package

You have a choice of making the Data Protection for Oracle installation package available for distribution on a DVD or on a server.

About this task

You can burn a DVD or place the package in a shared directory on a server. The package contains the Data Protection for Oracle code distribution files for installing the product.

Creating a package for installing in silent mode:

Use these instructions to create a silent installation package.

Before you begin

Before you create the package, decide where you are going to store the package. If you are burning a DVD, use a staging directory. If you are placing the package on a file server, you can use a staging directory or you can build the package directly on the file server.

Procedure

1. Run the following command to create the `tdpdpkg` staging directory:
   ```
   mkdir c:\tdpdpkg
   ```
2. From the command line, navigate to the staging directory `cd /d c:\tdpdpkg`
3. Copy the Data Protection for Oracle DVD distribution files to the staging directory: `xcopy g:\*.* . /s`
4. Replace the existing `setup.bat` with the one created in the previous step: `copy c:\setup.bat`

What to do next

The installation package can be placed on a DVD or made available from a shared directory.

Playing back the installation package in silent mode

You can run an installation package from a DVD or a shared directory. This process is called *playing back* the installation.

About this task

No visual cues exist to inform you when the installation finishes, although you can add visual cues to the batch file. Therefore, ensure that you allow enough time for the installation to complete.

Procedure

- If autostart is enabled, the silent installation begins as soon as the DVD is inserted into the drive.
- If the installation package is in a shared directory, a user can run the command as follows: From a staging directory that is called `tdpdpkg` at `\\machine1\d$`, the command `net use x: \\machine1\d$` can be run from a different computer to share the drive as drive x.

Creating batch files for installing in silent mode

You can create a batch file to install Data Protection for Oracle in silent mode, with the parameters that you want.

About this task

The following example shows a sample script that includes specific installation options.

```
@echo off
 rem ===================================
 rem sample silent install script
 rem
 setup /s /v"INSTALLDIR=\"X:\Install Path\" /qn"
 rem ===================================
 rem Code can be added after the
 rem installation completes to
 rem customize the dsm.opt files
 rem if needed.
 rem ===================================
```

Chapter 3. Configuring Data Protection for Oracle

Use these instructions to configure Data Protection for Oracle for backup and restore operations.

Before you begin

Data Protection for Oracle must be installed on your system and a Tivoli Storage Manager server must be available to communicate with Data Protection for Oracle.

About this task

Review all configuration information before you run any configuration tasks.

Configuration with default settings

Use the Data Protection for Oracle quick configuration option to quickly configure with default settings and minimal configuration tasks. Setup time is minimized and you proceed quickly to a state where you can begin backing up your Oracle databases.

Before you begin

Install Data Protection for Oracle. For detailed installation instructions, see Chapter 2, "Data Protection for Oracle installation," on page 5.

About this task

Use the instructions to configure Data Protection for Oracle on a 32-bit Windows Server system. Installation on a 64-bit Windows Server system is the same except for the installation path, which is `C:\Program Files\Tivoli\TSM\AgentOBA64`.

See "Configuring Data Protection for Oracle" on page 12 for detailed instructions on how to customize Data Protection for Oracle for your environment and processing needs.

Procedure

1. Change to the `C:\Program Files\Tivoli\TSM\AgentOBA` directory and copy the `tdpo.opt.smp` file to `tdpo.opt`. Edit the `tdpo.opt` file to include these options:

   ```
   dsmi_orc_config C:\Program Files\Tivoli\TSM\AgentOBA\dsm.opt
   dsmi_log C:\Program Files\Tivoli\TSM\AgentOBA
   ```

   For more information about these options, see "Available Data Protection for Oracle options" on page 13.
2. In this directory, copy the `dsm.smp` file to `dsm.opt`. Edit the `dsm.opt` file to include these options:

   ```
   COMMMethod TCPip
   TCPServeraddress x.x.x.x
   PASSWORDAccess generate
   NODename hostname_oracle
   ```

Replace *x.x.x.x* with the IP address of the Tivoli Storage Manager server to which Data Protection for Oracle backs up data.

For more information about these options and the `dsm.opt` file, see "Define Tivoli Storage Manager options in the client options file" on page 16.

3. Register the node to the Tivoli Storage Manager server with the following command:

   ```
   REG NODE hostname_oracle password maxnummp=n
   ```

   Where `hostname` is the name of the system that Data Protection for Oracle is installed, *password* is the password for this node, and *n* is equal to the number of channels that you are planning to use.

4. Make sure that the `<oracle user>` has the following permissions:
   - Read and Write permission to the `C:\Program Files\Tivoli\TSM\AgentOBA` directory.
   - Read and Write permissions to `tdpoerror.log` and the directory where it is stored.

5. Change to the `C:\Program Files\Tivoli\TSM\AgentOBA` directory and run the **tdpoconf password** command as the `<oracle user>` to generate the password file. Enter the password from Step 3 three times.

   For more information about this command, see "**password** command" on page 38.

6. Run the **tdpoconf showenvironment** command to view and confirm your configuration.

   For more information about this command, see "**showenvironment** command" on page 38.

7. As Oracle user, run the RMAN backup script with the **ENV=(TDPO_OPTFILE=C:\Program Files\Tivoli\TSM\AgentOBA\tdpo.opt)** parameter specified. For example:

   ```
   run
   {
      allocate channel t1 type 'sbt_tape' parms
          'ENV=(TDPO_OPTFILE=C:\Program Files\Tivoli\TSM\AgentOBA\tdpo.opt)';

      backup
         filesperset 5
         format 'df_%t_%s_%p'
         (database);

     }
   ```

   Note, the `allocate channel` entry is divided on two lines after the `parms` option is specified to accommodate page formatting.

   For more information about RMAN backup scripts, see "RMAN and Data Protection for Oracle" on page 23.

Configuring Data Protection for Oracle

After Data Protection for Oracle is successfully installed, you must complete the configuration tasks.

Procedure

1. Define Data Protection for Oracle options in the tdpo.opt file.
2. Register the Data Protection for Oracle node to a Tivoli Storage Manager server.
3. Define Tivoli Storage Manager options in the dsm.opt file.
4. Define Tivoli Storage Manager policy requirements.

5. Initialize the password with a Tivoli Storage Manager server.

Results

If you would like to configure Data Protection for Oracle using default settings, see "Configuration with default settings" on page 11 for instructions.

Define Data Protection for Oracle options in the `tdpo.opt` file

You must define options to control the way Data Protection for Oracle backs up and restores data.

About this task

The Data Protection for Oracle options file, `tdpo.opt`, contains options that determine the behavior and performance of Data Protection for Oracle. The only environment variable Data Protection for Oracle recognizes within an RMAN script is the fully qualified path name to the `tdpo.opt` file. Therefore, some RMAN scripts must be edited to use **`TDPO_OPTFILE`**`=fully qualified path and file name of options file` variable in place of other environment variables. For example:

```
allocate channel t1 type 'sbt_tape' parms
       'ENV=(TDPO_OPTFILE=C:\RMAN\scripts\tdpo.opt)'
```

For further information about RMAN scripts, see "Editing RMAN scripts" on page 24 for further information. Note, the `allocate channel` entry is divided on two lines after the `parms` option to accommodate page formatting.

If the **`TDPO_OPTFILE`** variable is not provided, Data Protection for Oracle uses the `tdpo.opt` file in the Data Protection for Oracle default installation directory. If this file does not exist, Data Protection for Oracle fails.

Though it is possible to change values in the options file, you cannot change the `dsmi` options until you restart Data Protection for Oracle. Data Protection for Oracle loads these values from the default `tdpo.opt` file into the default installation directory when the Oracle service is started.

Note:

- For best results, use the `tdpo.opt` file exclusively instead of default parameters.
- RMAN and the `tdpoconf` and `tdposync` utilities use the options that are defined in the `tdpo.opt` file.
- By default, the `tdpo.opt` file is in the directory where Data Protection for Oracle is installed.
- You can specify options in the `tdpo.opt` file in both uppercase or lowercase type.

Available Data Protection for Oracle options

The options that can be set in the `tdpo.opt` file for Data Protection for Oracle are described.

The following options can be set in the `tdpo.opt` file:

`dsmi_log`
Specify the directory that contains the Data Protection for Oracle error log file `tdpoerror.log`.

`dsmi_orc_config`
Specify the complete path to the Tivoli Storage Manager client user options file `dsm.opt` used during the Data Protection for Oracle session. If you do

not specify this option, Data Protection for Oracle looks for the options file in the Data Protection for Oracle installation directory. You must specify this option if your Tivoli Storage Manager client user options file is in a directory other than the Data Protection for Oracle installation directory.

tdpo_fs

Specify a file space name on the Tivoli Storage Manager server for Data Protection for Oracle backup, delete, and restore operations. The file space name can contain a string of 1-1024 characters.

- The default file space name is `adsmorc`.
- When you have more than one Oracle database, use this option to back up each Oracle target database to its own file space on the Tivoli Storage Manager server.
- The file space name in the `include/exclude` statement must match the file space name that is specified in the `tdpo_fs` option for `include/exclude` processing to function correctly.

tdpo_date_fmt

This option specifies the format that you want to use to display dates.

You can specify a number, 1 - 5. The default value is 1.

1 `MM/DD/YYYY` (Default value)

2 `DD-MM-YYYY`

3 `YYYY-MM-DD`

4 `DD.MM.YYYY`

5 `YYYY.MM.DD`

tdpo_num_fmt

This option specifies the format that you want to use to display numbers. You can specify a number, 1 - 6. The default value is 1.

1 1,000.00 (Default value)

2 1,000,00

3 1 000,00

4 1 000.00

5 1.000,00

6 1'000,00

tdpo_time_fmt

This option specifies the format that you want to use to display time.

You can specify a number, 1 - 4. The default value is 1.

1 `23:00:00` (Default value)

2 `23,00,00`

3 `23.00.00`

4 `12:00:00 A/P`

tdpo_mgmt_class_2

This option specifies the second management class that is used for copy 2 in the RMAN duplex copy command.

tdpo_mgmt_class_3

This option specifies the third management class that is used for copy 3 in the RMAN duplex copy command.

tdpo_mgmt_class_4

This option specifies the fourth management class that is used for copy 4 in the RMAN duplex copy command. Four copies is the maximum that is allowed by RMAN.

Note: See "The Duplex Copy function" on page 26 for specific details on using management class options.

Register the Data Protection for Oracle node to a Tivoli Storage Manager server

The Data Protection for Oracle node name and password when required must be registered to the Tivoli Storage Manager server before you can begin requesting backup and restore services. The process of setting up a node name and password with the Tivoli Storage Manager server is called registration.

About this task

The following information is needed to register Data Protection for Oracle with the Tivoli Storage Manager server:

- Data Protection for Oracle node name:

  The node name identifies the instance on which Data Protection for Oracle is installed. Use a separate and unique node name for Data Protection for Oracle. This prevents any confusion with an existing Tivoli Storage Manager backup-archive client on the same workstation.
- Initial password:

  Specify the password that you want to use, if a password is required.

The following information is defined by the Tivoli Storage Manager administrator:

- The policy domain to which your client node belongs.

  A policy domain contains policy sets and management classes that control how Tivoli Storage Manager manages the objects you back up. Rather than binding Data Protection for Oracle backups to a different management class, define a unique policy domain for Data Protection for Oracle node names. These backups can be bound to the default management class within this unique policy domain. Rather than binding a different management class for Oracle backups, specify a different domain for the backups with a separate management class.
- The authority to enable compression.

  The Tivoli Storage Manager administrator can specify the server to compress files. If the Tivoli Storage Manager administrator specifies that the compression decision belongs to the client **compression**`client`, you must specify **compression**`yes` in the client user options file `dsm.opt` so that the Data Protection for Oracle node is able to compress objects before it sends them to the Tivoli Storage Manager server.
- The authority to delete backup data from Tivoli Storage Manager storage.

  The Data Protection for Oracle node can only delete backed up data from Tivoli Storage Manager storage if the Tivoli Storage Manager administrator registers the node with `backdelete` authority. Specify the following option to allow `backdelete` authority:

  ```
  backdelete yes
  ```

  Note, when `backdelete no` is specified and a deletion request is made, the request fails and an error message displays. Therefore, specify `backdelete yes` for the object to be immediately removed from the Tivoli Storage Manager

server when the next inventory expiration occurs. This expiration also makes the previously used storage space available for new use.

Define Tivoli Storage Manager options in the client options file

You must define some Tivoli Storage Manager options after the Data Protection for Oracle node is registered to the Tivoli Storage Manager server:

About this task

- These options are defined in the Tivoli Storage Manager client user options file `dsm.opt` by default.
- Note, the Tivoli Storage Manager client user options file `dsm.opt` by default, that you must edit for Data Protection for Oracle is in the directory that is specified by the `dsmi_orc_config` option. If this option is not specified, Data Protection for Oracle looks for this options file in the Data Protection for Oracle installation directory.
- Data Protection for Oracle provides sample Tivoli Storage Manager options files that you can modify for this purpose. These sample files are in the Data Protection for Oracle installation directory.
- The Tivoli Storage Manager administrator can provide you with the TCP server address **tcpserveraddress** and communication method **commmethod** for connecting Data Protection for Oracle to the Tivoli Storage Manager server.

Required options

You must set required Tivoli Storage Manager client options to operate Data Protection for Oracle.

Specify the required options in the Tivoli Storage Manager client user options file `dsm.opt` by default, in the directory that is specified by the `dsmi_orc_config` option.

nodename

Specify the Data Protection for Oracle node name that is used during operations with the Tivoli Storage Manager server. The node name can contain a string of 1 - 64 characters.

To restore data from one Oracle server to another with Data Protection for Oracle, make sure that the value of the `nodename` option in the `dsm.opt` file on the target Oracle server equals the value of the `nodename` option in the `dsm.opt` file on the source Oracle server. Data Protection for Oracle, the Tivoli Storage Manager backup-archive client, and the Tivoli Storage Manager API must be at the same levels on both the source Oracle server and the target Oracle server. If there is a password that is associated with the `nodename` option in the `dsm.opt` file on the target Oracle server, use the `tdpoconf` utility to generate the local password file when the value of the `nodename` option changes.

passwordaccess

Specify `passwordaccess generate`. This option allows the Tivoli Storage Manager API to manage all password actions after the password is created with the **tdpoconf password** command. The Tivoli Storage Manager API saves the current encrypted password in the Windows registry and automatically generates a new password when the current password expires. This method of password management is useful when you are running unattended scheduled backups because it ensures that the backup never fails with an expired password.

tcpserveraddress

Specify the TCP/IP address for the Tivoli Storage Manager server to be used for Oracle backups.

commmethod

Specify the communication method for Data Protection for Oracle to communicate with the Tivoli Storage Manager server. Note, this option requires other Tivoli Storage Manager options, depending on the communication method you specify.

Other configuration options to consider

There are other Tivoli Storage Manager client options that you can use when you are configuring Data Protection for Oracle.

You can specify other options in the Tivoli Storage Manager client user options file `dsm.opt`.

compression

Specify whether the Tivoli Storage Manager API compresses data before it sends it to the Tivoli Storage Manager server. You can specify `yes` or `no`. The default value is `No`. The value of the compression option for Data Protection for Oracle is allowed only if the Tivoli Storage Manager administrator leaves the compression decision to the node. Enabling compression affects performance in three ways:

- Processor usage is higher on the system on which Data Protection for Oracle is running.
- Network bandwidth usage is reduced because fewer bytes are transmitted.
- Storage usage on the Tivoli Storage Manager server is reduced.

When any of the following conditions exist, you should specify `yes`:

- The network adapter has a data overload.
- Communications between Data Protection for Oracle and the Tivoli Storage Manager server are over a low-bandwidth connection.
- There is heavy network traffic.

When any of the following conditions exist, you should specify `no`:

- The system that is running Data Protection for Oracle has a processor overload. The added processor usage as a result of enabling compression can impact other applications, including the Oracle server.

  You can monitor processor and network resource usage with the Performance Monitor program that is shipped with Windows.
- You are not constrained by network bandwidth. In this case, you can achieve the best performance by specifying **compression** `no` and enabling hardware compaction on the tape drive, which also reduces storage requirements.
- Hardware compression is in use for the media where Data Protection for Oracle data is stored.

After a completed backup operation, view the throughput rate and the compression status for a backup object in the Tivoli Storage Manager server activity log file. Run the Tivoli Storage Manager server **QUERY ACTLOG** command in the Tivoli Storage Manager server administrative client window. The throughput rate and the compression status are not written to the activity log when activity logging is disabled on the Tivoli Storage

Manager server. See the **SET ACTLOGRETENTION** command in the *Tivoli Storage Manager Administrator's Reference* for complete activity logging information.

You can also determine whether objects were compressed by running the **tdposync query** command.

deduplication
Specify whether the Tivoli Storage Manager API deduplicates data before it sends it to the Tivoli Storage Manager server. You can specify `Yes` or `No`. The default value is `No`. The value of the deduplication option for Data Protection for Oracle applies only if the Tivoli Storage Manager administrator allows client-side data deduplication.

You can determine if objects are deduplicated by running the **tdposync query** command or by examining the Tivoli Storage Manager server activity log file.

The `deduplication` and `enablelanfree` options are mutually exclusive. Therefore, you must use either one option or the other, but not both options together.

The `deduplication` and `enableclientencryptkey` options are also mutually exclusive. Therefore, you must use either one option or the other, but not both options together.

enablelanfree
Specify whether you run backup or restore operations in a LAN-free environment if you are equipped to do so. You can specify `yes` or `no`. The default value is `no`. You can avoid network constraints by shifting the movement of data to a storage area network (SAN). After a completed backup operation, view the LAN-free status for a backup object in the Tivoli Storage Manager server activity log file. For more information, see the appropriate Storage Agent User's Guide.

The `enablelanfree` and `deduplication` options are mutually exclusive. Therefore, you must use either one option or the other, but not both options together.

include
When a management class other than the default management class is defined within an existing policy domain, add an include statement to the client options file that is used by the Oracle node.

You must add an include statement to the `dsm.opt` file.

This include statement binds the Oracle backup objects to the management class that is defined for managing these objects. The include statement uses the following naming convention:

```
\FilespaceName\orcnt\ObjectName
```

The FORMAT parameter in the RMAN script can also be used to assist with object naming. For example, if the FORMAT parameters (in the RMAN script) specified the following values for databases and logs:

```
format 'DB_%u_%p_%c'
format 'LOG_%u_%p_%c'
```

The include statement in the `dsm.opt` file, which is used by the Oracle node, would be as follows:

```
INCLUDE \FilespaceName\orcnt\DB* mgmtclassname
INCLUDE \FilespaceName\orcnt\LOG* mgmtclassname
```

Make sure that the **FORMAT** parameter specifies a unique name for the backup. If the object name exists on the Tivoli Storage Manager server, the backup might fail with an RC=8 error that is recorded in the sbtio.log file.

enableclientencryptkey
When enableclientencryptkey is set to yes, Data Protection for Oracle provides 128-bit transparent encryption of Oracle databases during backup and restore processing. One random encryption key is generated per session and is stored on the Tivoli Storage Manager server with the object in the server database. Although Tivoli Storage Manager manages the key, a valid database must be available to restore an encrypted object.

Important: The enableclientencryptkey and deduplication options are mutually exclusive because encrypted files cannot be deduplicated. Therefore, you can use only one or the other option, but not both options together.

You can specify the databases that you want encrypted by adding an include statement with the include.encrypt option in the client user options file dsm.opt.

For example, to enable transparent encryption, do the following steps:

1. Edit the client user options file, dsm.opt.
2. Specify enableclientencryptkey yes.
3. Specify encryptiontype AES128, or DES56.
4. Specify the objects to encrypt. This example encrypts all data:
   ```
   include.encrypt        \adsmorc\...\*
   ```

Thus, the encryption options would be as follows in this client user options file, dsm.opt:

```
enableclientencryptkey yes
encryptiontype aes128
include.encrypt        \adsmorc\...\*
```

See *IBM Tivoli Storage Manager Using the Application Programming Interface* for more details about the enableclientencryptkey option.

You can determine whether objects were encrypted by running the **tdposync query** command.

Related concepts:

"LAN-free data transfer" on page 3

Define Tivoli Storage Manager policy requirements

Data Protection for Oracle requires special Tivoli Storage Manager policy domain settings.

About this task

RMAN uses the **format** parameter in the RMAN script to generate unique backup file names. Because all backup objects inserted into the Tivoli Storage Manager backup storage pool have unique file names, they never expire on the Tivoli Storage Manager server. As a result, Data Protection for Oracle requires the following Tivoli Storage Manager policy domain settings:

Backup copy group values
Data Protection for Oracle provides the tdposync utility to remove

unwanted backup objects from the Tivoli Storage Manager server. Set the following Tivoli Storage Manager backup copy group options:

- `verdeleted 0`
- `retonly 0`

When Data Protection for Oracle marks a backup object inactive, that object is deleted from the Tivoli Storage Manager server the next time expiration processing occurs. A backup object is marked for immediate expiration when you delete it through RMAN with the Data Protection for Oracle interface or with the `tdposync` utility. Note, an inactive backup object cannot be restored through RMAN with the Data Protection for Oracle interface.

Note:

1. The Tivoli Storage Manager administrator must also register your node by specifying `backdelete yes` in order for backup objects to be deleted. However, be aware that a backup object is marked for immediate expiration when `backdelete yes` and you delete it through RMAN with the Data Protection for Oracle interface or with the `tdposync` utility. Note, when `backdelete no` is specified and a deletion request is made, the request fails and an error message displays.
2. The following backup copy group options are not applicable to Data Protection for Oracle:
   - `frequency`
   - `verexists`
   - `retextra`
   - `mode`
   - `serialization`

   Data Protection for Oracle accepts default values for these options.
3. An archive copy group is not required (although it can exist) because Data Protection for Oracle stores all objects as backup objects on Tivoli Storage Manager.

Management class

Tivoli Storage Manager uses management classes to manage backups on the Tivoli Storage Manager server. When you back up a database, the default management class for your node is used. Because the policy requirements for Data Protection for Oracle might be different from the wanted settings for the regular Tivoli Storage Manager backup-archive clients, you must have a different management class that is defined for Data Protection for Oracle. You must define a separate policy domain where the default management class has the required settings. Then, register all Data Protection for Oracle nodes to that domain.

If you choose to define a new management class within an existing policy domain, not the default management class for that domain, then you must add an `include` statement to the Data Protection for Oracle options file to bind all objects to that management class.

The following steps assign a management class name `orcbackup` to all Oracle backups with a default file space name `adsmorc`:

1. Add this `inclexcl` entry under the server stanza you use in the `dsm.opt` file:

   ```
   inclexcl C:\myfile\include.def
   ```

2.

Add the following `include` entry to the `C:\myfile\include.def` file:

```
include \adsmorc\...\* orcbackup
```

Note: The file space name in the `include/exclude` statement must match the file space name that is defined with the `tdpo_fs` option. If a file space name other than the default value `adsmorc` is used:

a. You must specify the file space name with the `tdpo_fs` option.

b. You must specify the file space name that is defined in the `tdpo_fs` option in the `include/exclude` statement.

All the files that are backed up with a default file space name of `adsmorc` are assigned to management class *orcbackup*.

Note: Data Protection for Oracle stores all objects as backup objects on Tivoli Storage Manager storage, so an archive copy group is not required, although it can exist.

See your Tivoli Storage Manager administrator or see the *Tivoli Storage Manager Administrator's Guide* for more information about defining or updating Tivoli Storage Manager policy domains and copy groups.

Initialize the password with a Tivoli Storage Manager server

The administrator must run the `tdpoconf` utility program to set the password before you use Data Protection for Oracle.

Related reference:

"tdpoconf utility" on page 38

Chapter 4. Protecting Oracle Server data

Use Data Protection for Oracle to back up and restore Oracle Server data.

Before you begin

Data Protection for Oracle must be installed and configured on your system and an Oracle Server must be available.

RMAN and Data Protection for Oracle

You can run full or partial, offline, or online backups with Oracle. When you identify which database to back up, Oracle locates all necessary files and sends them to the Tivoli Storage Manager server through Data Protection for Oracle.

About this task

Data Protection for Oracle provides an interface between Oracle Media Management API calls and Tivoli Storage Manager API routines.

Starting RMAN

Use RMAN to back up and restore an Oracle database.

About this task

In this example, the catalog database contains a registered target database. Start an RMAN session with this command:

```
$>  rman target xxx/yyy@target rcvcat aaa/bbb@catalog
  cmdfile bkdb.scr msglog bkdb.log
```

RMAN starts in the sequence shown.

```
target xxx/yyy@target: connect to target database
using user xxx and password yyy with connect string target
rcvcat aaa/bbb@catalog: connect to catalog database
using user aaa and password bbb with connect string catalog
cmdfile bkdb.scr:  run bkdb.scr script
msglog bkdb.log:  log the output messages in bkdb.log
```

Tip: In the example, RMAN creates a log file, `bkdb.log`, in the current working directory. If an error occurs, the error stack is logged to the log file.

After a completed backup or restore operation, view the throughput rate and encryption status for a backup object in the Tivoli Storage Manager server activity log file. Run the Tivoli Storage Manager server **QUERY ACTLOG** command in the Tivoli Storage Manager server administrative client window. A message similar to the following is displayed:

```
08/03/11
16:23:08
ANE4991I (Session: 67, Node: MACHINE_ORC)  DP Oracle Win64 ANU0599  TDP for Oracle:
(5508): =>()
ANU2526I Backup details for backup piece \adsmorc\orcnt\df_727444762_116_1
(database "orcl").
Total bytes processed: 9961472. Deduplicated: Yes. Bytes after deduplication: 2272805.
Deduplication reduction: 77.18%. Compressed: Yes. Bytes after compression: 52253.
Compressed by: 97.70%. Encryption: None. LAN-Free: No. Total bytes sent: 52253.
Total data reduction: 99.48%. Total processing time: 00:00:01.
Throughput rate: 9728.00Kb/Sec. (SESSION: 67)
```

Editing RMAN scripts

You must edit existing RMAN scripts to use **TDPO_OPTFILE**=*fully qualified path and file name of options file* variable in place of other environment variables.

About this task

Sending options with the send command

Use the Oracle RMAN **send** command in an RMAN script to pass Tivoli Storage Manager options to the Tivoli Storage Manager API.

Before you begin

To send options from the Tivoli Storage Manager to the Tivoli Storage Manager API, you must specify the **send** command in an RMAN script.

About this task

Use the **send** command to set Tivoli Storage Manager options such as `TCPServeradddress` and `TCPport` to the Tivoli Storage Manager API. You can customize the actions that the script takes without updating the existing Data Protection for Oracle or Tivoli Storage Manager API options files. Any option that is sent through the **send** command overrides the option that is specified in the Data Protection for Oracle or Tivoli Storage Manager API options files.

- You can specify multiple Tivoli Storage Manager API options in the same **send** command.
- The ENABLELANFREE and DEDUPLICATION options are mutually exclusive. If both options are defined, client-side data deduplication does not occur.
- The ENABLECLIENTENCRYPTKEY and DEDUPLICATION options are also mutually exclusive. If both options are defined, client-side data deduplication does not occur.
- You can specify any Tivoli Storage Manager API option with the **send** command.

Procedure

Specify the **send** command in an RMAN script. You can specify one or more Tivoli Storage Manager options in a **send** command string. The **send** command string can contain up to 512 bytes. To back up an Oracle database to the Tivoli Storage Manager server named `halley` at TCP/IP port 1601, and to enable the cache for client-side data deduplication for only channel `t1`, specify the following statements in an RMAN script:

```
allocate channel t1 type 'SBT_TAPE';
SEND channel 't1' '-TCPSERVER=halley -TCPPORT=1601 -ENABLEDEDUPCACHE=YES';
```

Results

Data Protection for Oracle passes the command string to the Tivoli Storage Manager API. The Tivoli Storage Manager API validates the contents of the string. If an invalid entry is detected, the API issues an ANS****E message to Data Protection for Oracle. The message returns an error condition to Oracle RMAN and stops processing.

Related tasks:

"RMAN script examples"

RMAN script examples

Sample RMAN scripts illustrate how to create parallel backup streams to Tivoli Storage Manager server storage.

Example

In these examples, to back up to Tivoli Storage Manager by using Data Protection for Oracle, you must specify `type 'sbt_tape'` in the RMAN script or within the global RMAN configuration settings.

`Example 1:`

When the Tivoli Storage Manager server and Oracle system have multiple network cards, you can back up your data with multiple network paths to improve network throughput. Your environment is set up as follows:

- The Oracle system has two network cards with two addresses, A and B.
- The Tivoli Storage Manager server also has two network cards with two addresses, C and D.
- Paths exist between A and C, B and D, but not between A and D or B and C.

Create two backup streams or Oracle channels, without using two separate options files to point to different two different addresses. Channel `t1` goes to address C, channel `t2` goes to address D. Be careful not to send parts of your backup to two different Tivoli Storage Manager servers because it cannot be restored.

You can maintain one Data Protection for Oracle options file and change the Tivoli Storage Manager server specification in an RMAN script in the following manner:

```
run
{
   allocate channel t1 type 'sbt_tape';
      SEND channel t1 '-TCPSERVER=<C>';
   allocate channel t2 type 'sbt_tape';
      SEND channel t2 '-TCPSERVER=<D>';

   backup
      filesperset 5
      format 'df_%t_%s_%p'
      (database);
   release channel t2;
   release channel t1;
}
```

`Example 2:`

This backup script allocates two parallel connections to the Tivoli Storage Manager server. The Tivoli Storage Manager server views these connections as two separate sessions:

```
run
{
   allocate channel t1 type 'sbt_tape' parms
            'ENV=(TDPO_OPTFILE=C:\oracle\scripts\tdpo.opt)';
   allocate channel t2 type 'sbt_tape' parms
            'ENV=(TDPO_OPTFILE=C:\oracle\scripts\tdpo.opt)';

   backup
      filesperset 5
      format 'df_%t_%s_%p'
      (database);

   }
```

Example 3:

This restore script allocates one parallel connection to the Tivoli Storage Manager server:

```
run
{
allocate channel t1 type 'sbt_tape' parms
'ENV=(TDPO_OPTFILE=C:\oracle\scripts\tdpo.opt)';
restore database;
recover database;
alter database open;
}
```

Note:

1. The `allocate channel` entry is divided on two lines after the `parms` option to accommodate page formatting.
2. The Oracle database must be in mount mode for the restore to succeed.

The Duplex Copy function

With Data Protection for Oracle, you can use the Oracle Server Duplex backup feature to make up to four exact duplicate copies of a backup. The backup can then be stored on different backup media.

About this task

A different management class is required for each backup copy. By default, the primary management class is the default management class on the policy domain that is defined for the Data Protection for Oracle node.

Note: It might be necessary to define the Oracle parameter value (BACKUP_TAPE_IO_SLAVES=TRUE) in the `init.ora` file of the target database for Data Protection for Oracle to use the duplex copy feature. Refer to your Oracle documentation about the use of this Oracle parameter.

For example, to create four backup copies:

Procedure

1. Specify the following option in the RMAN backup script:
   ```
   set duplex=4
   ```
2. Define the following options in the `tdpo.opt` file:
   - `tdpo_mgmt_class_2`
   - `tdpo_mgmt_class_3`
   - `tdpo_mgmt_class_4`

3. Run the RMAN backup script.

Results

The following backup behavior occurs:

- The first backup copy is bound to the default management class to which the node is registered.
- The second backup copy is bound to the management class defined by the `tdpo_mgmt_class_2` option.
- The third backup copy is bound to the management class defined by the `tdpo_mgmt_class_3` option.
- The fourth backup copy is bound to the management class defined by the `tdpo_mgmt_class_4` option.

Note: Take note of the considerations provided:

- The duplex copy feature does not use *include* statements. It uses the management classes that are specified in the `tdpo.opt` file.
- You receive an error message if you specify **`set duplex =4`** in the RMAN backup script and do not define enough `tdpo_mgmt_class` options in the `tdpo.opt` file.
- To place duplicate copies on different media:
  - Make sure that the storage pool information for each backup copy group within the management classes is not the same.
  - Make sure that backups from these different storage pools are not moved to the same storage pool later.
- Duplicate data is sent across the network.
- If you specify **`set duplex =4`** and allocate one channel in the RMAN backup script, RMAN will start four sessions to the Tivoli Storage Manager server. Likewise, if you specify **`set duplex =4`** and allocate two channels in the RMAN backup script, RMAN will start eight sessions to the Tivoli Storage Manager server.
- The duplex copy feature sends the backup copies simultaneously. If the backup destination is tape, the number of sessions is a multiple of the duplex value. As a result, make sure that RMAN does not start more sessions than the maximum mount points allowed by the Tivoli Storage Manager server. The node definition option on the Tivoli Storage Manager server **`maxnummp`** determines the maximum number of mount points a client node can use on the Tivoli Storage Manager server during a backup operation. View the maximum mount points that are allowed by the Tivoli Storage Manager server for a particular node by entering the **`query node`** command from a Tivoli Storage Manager Administrative Client prompt:

  ```
  q node f=d
  ```

  See the appropriate *Tivoli Storage Manager Administrator's Reference* for more information about this option.

Review your current Oracle documentation about the duplex backup function.

Removing old backups

Data Protection for Oracle uses the Tivoli Storage Manager backup repository. Each database backup creates an object with a unique name. Since these objects have unique names, they always remain active and never expire. The database administrator (DBA) can control and coordinate copies that are removed from the Tivoli Storage Manager server with RMAN.

Before you begin

Ensure that **backdelete**=*yes* is specified by the Tivoli Storage Manager administrator during registration of your node. Specifying this parameter gives you permissions to delete backup objects.

About this task

Note: Make sure to use the same `tdpo.opt` file that was used for the original backup. Using this file enables the backup objects to be found on the Tivoli Storage Manager server.

Removing a backup example

A sample script for removing an old backup is provided.

About this task

To remove an old backup, issue this command from the RMAN prompt:

```
run
{
   allocate channel for delete type 'sbt_tape' parms
            'ENV=(TDPO_OPTFILE=C:\oracle\scripts\tdpo.opt)';

   change backupset backupset number delete;

}
```

Refer to the Oracle RMAN manual for more information about the **change** command and its options.

Setting up a schedule example

This example illustrates how to set up a schedule to automatically back up Oracle server databases.

About this task

For consistency, this procedure uses specific information. However, you can define a command file with any set of commands you choose. You can then use the same command file to define schedules on other Tivoli Storage Manager servers. All command information is presented as command-line interface entries.

This schedule in this procedure contains the following settings:

- The Data Protection for Oracle node name is `NodeA1`.
- The password for node name `NodeA1` is `PasswordA1`.
- The policy domain to which node name `NodeA1` is registered is `PolicyA1`.
- The schedule is a daily backup of an online Oracle database.
- The scheduled backup begins between 9:00 and 9:15 PM.

Setting up a schedule on the Tivoli Storage Manager server

Define a schedule on the Tivoli Storage Manager server to automatically run online backups of Oracle server databases.

Procedure

To set up a schedule on the Tivoli Storage Manager server:

1. Define the following schedule on the Tivoli Storage Manager server. You can enter the command on the Tivoli Storage Manager server console or on an administrative client. The administrative client does not have to be running on the same system as the Tivoli Storage Manager server.

   ```
   define schedule PolicyA1 daily_orcbkup description="07Daily Online DB Backup"
   action=command objects="C:\Program Files\Tivoli\TSM\AgentOBA\sched\orcsched.cmd"
   starttime=21:00 duration=15 durunits=minutes period=1 perunits=day
   dayofweek=any
   ```

   The following message must display before you proceed to the next step:

   ```
   ANR2500I Schedule daily_orcbkup defined in policy domain PolicyA1.
   ```

2. Issue the following command to associate the Data Protection for Oracle node to the backup schedule defined in step 1:

   ```
   define association PolicyA1 daily_orcbkup NodeA1
   ```

Results

- A backup schedule is now defined on the Tivoli Storage Manager server.
- The backup schedule runs the command file `orcsched.cmd`, in the `C:\Program Files\Tivoli\TSM\AgentOBA\sched\` or `c:\progra~1\tivoli\tsm\agentoba\sched\` directory.
- The backup runs daily around 9:00 PM.
- The backup schedule can start on any day of the week.
- You can run the Tivoli Storage Manager **query schedule** and **query association** commands to confirm that the schedule and node association are set correctly.

Setting up a schedule on the workstation with the Oracle Server

Use this procedure to define a schedule on the workstation with the Oracle Server.

About this task

This example assumes the following setup:

- The Tivoli Storage Manager backup archive client is installed on the Oracle Server in the following directory:

  ```
  C:\Program Files\Tivoli\TSM\baclient
  ```

- The Data Protection for Oracle for the Oracle server is installed in the following directory:

  ```
  C:\Program Files\Tivoli\TSM\AgentOBA
  ```

- The options files in each of these directories are updated so that the communication parameters point to the Tivoli Storage Manager server.

Procedure

To set up a schedule on the workstation with the Oracle Server:

1. Log in with a Windows account that has administrative privileges.
2. Change to the backup archive client installation directory with this command:
   `C:\>cd \Program Files\Tivoli\TSM\baclient`
3. Use the Tivoli Storage Manager Client Service Configuration Utility `dsmcutil` to install the Tivoli Storage Manager Scheduler Service. Type in the command from your current location in the backup archive client installation directory. For example:

   ```
   dsmcutil inst /name:"TSM Oracle Bkup Scheduler"
   /node:nodea1 /password:passworda1 /autostart:yes
   /clientdir:"C:\Program Files\Tivoli\TSM\baclient"
   /optfile:"C:\Program Files\Tivoli\TSM\AgentOBA\dsm.opt"
   /validate:yes
   ```

   You can modify the command to contain options specific to your schedule.

   This example shows the output:

   ```
   TSM Windows NT Client Service Configuration Utility
   Command Line Interface - Version 7, Release 1, Level 0
   (C) Copyright IBM Corporation, 1990, 2013, All Rights Reserved.
   Last Updated Jun 29 2012
   TSM Api Version 7.1.0

   Command: Install TSM Client Service
   Machine: ABC-ARTXNC(Local Machine)



   Installing TSM Client Service:

          Machine          : ABC-ARTXNC
          Service Name     : TSM Oracle Bkup Scheduler
          Client Directory : C:\Program Files\Tivoli\TSM\baclient
          Automatic Start  : yes
          Logon Account    : LocalSystem

   The service was successfully installed.


   Creating Registry Keys ...

   Updated registry value 'ImagePath' .
   Updated registry value 'EventMessageFile' .
   Updated registry value 'TypesSupported' .
   Updated registry value 'TSM Oracle Bkup Scheduler' .
   Updated registry value 'ADSMClientKey' .
   Updated registry value 'OptionsFile' .
   Updated registry value 'EventLogging' .
   Updated registry value 'ClientNodeName' .

   Generating registry password ...
   Authenticating TSM password for node NODEA1 ...

   Connecting to TSM Server via client options file
   'C:\Program Files\Tivoli\TSM\AgentOBA\dsm.opt' ...

   Password authentication successful.

   The registry password for TSM node NODEA1 has been updated.
   ```

```
Starting the 'TSM Oracle Bkup Scheduler' service .......

The service was successfully started.
```

The options file that is defined for Data Protection for Oracle is used by the scheduler when it validates the node and password. The options file is also used when contacting the Tivoli Storage Manager server for schedule information. This example assumes that the `dsm.opt` file is updated so that the communication parameters point to the Tivoli Storage Manager server to which the Oracle databases are to be backed up.

If this message displays:

```
A communications error occurred connecting to the TSM server
```

Ensure that the `dsm.opt` file contains entries that point to the correct Tivoli Storage Manager server. Also, ensure that the Tivoli Storage Manager server is running. If you must make a correction, enter the following command:

```
dsmcutil  remove /name:"TSM Oracle Bkup Scheduler"
```

Then enter the command that is given at the beginning of this step.

4. Ensure that Data Protection for Oracle is running under the Oracle Site Services account so that it can access the Oracle backup API. The Data Protection for Oracle scheduler service must log on with that account. The scheduler service account information can be specified through the services applet in the control panel.
5. Create a batch file that is called `orcsched.cmd` and place it in the following location:

   ```
   C:\Program Files\Tivoli\TSM\AgentOBA\sched\orcsched.cmd
   ```

   Note: The scheduler service runs from the Windows system directory, so it is important that complete paths are specified for all file names and non-system commands. The scheduler service checks the Windows system directory for input and produces its output by default.

   The following is an example of the `orcsched.cmd` file:

   ```
   rem orcsched.cmd
   rem =======================

   rem =======================
   rem setting oracle sid
   rem =======================
   set oracle_sid=ilr

   rem =======================
   rem set orc executable binary
   rem =======================
   set ora_exe=c:\oracle\bin\rman.exe

   %ora_exe% cmdfile 'C:\rman\bkdb.rmn'
   ```

   The following is an example of the `bkdb.rmn` file:

   ```
   connect target agnttest/agttest
   run
   {
   allocate channel ch1 type 'SBT_TAPE' parms
    'ENV=(TDPO_OPTFILE=C:\oracle\tdpo.opt)';
   allocate channel ch2 type 'SBT_TAPE' parms
    'ENV=(TDPO_OPTFILE=C:\oracle\tdpo.opt)';
   allocate channel ch3 type 'SBT_TAPE' parms
    'ENV=(TDPO_OPTFILE=C:\oracle\tdpo.opt)';
   allocate channel ch4 type 'SBT_TAPE' parms
   ```

```
 'ENV=(TDPO_OPTFILE=C:\oracle\tdpo.opt)';
backup (database);
release channel ch1;
release channel ch2;
release channel ch3;
release channel ch4;
}
```

Note: The `allocate channel` entry for each channel is divided on two lines after the `parms` option to accommodate page formatting. The `bkdb.rmn` file must have the `allocate channel` entry for each channel specified on one line of text.

6. The scheduler service is now installed, but is not yet started. To start the service, issue the following command:

   ```
   net start "TSM Oracle Bkup Scheduler"
   ```

   A message is displayed indicating that the Scheduler is starting up.

   Note, because **autostart**=yes is specified, the Tivoli Storage Manager scheduling service is automatically started each time the Windows system is restarted.

   Your system is now ready to run automatic daily online database backups.

Results

Note: If you want to use the Tivoli Storage Manager server scheduling mode:

1. Ensure that the Data Protection for Oracle options file has the **tcpclientaddress** and **tcpclientport** options specified. If you want to run more than one scheduler service, use the same **tcpclientaddress**. However, you must use different values for **tcpclientport** in addition to the different node names. Scheduling Data Protection for Oracle with the regular Windows backup archive client is an example of running more than one scheduler service.

   Server-prompted scheduling is supported only when TCP/IP communication is being used. By default, Data Protection for Oracle uses the polling schedule mode.

2. If any changes that affect the scheduler service are made to the Data Protection for Oracle options file, the scheduler service must be restarted to pick up the changes. For example, changes to the Tivoli Storage Manager server address, schedule mode, or the TCP/IP address or port. The restart is done by entering these commands:

   ```
   net stop "TSM Oracle Bkup Scheduler"
   net start "TSM Oracle Bkup Scheduler"
   ```

3. The file named `dsmsched.log` contains status information for the Tivoli Storage Manager scheduler service. Though the default directory is `\Tivoli\TSM\baclient\sched\dsmsched.log`, you can specify a different directory, such as `\Tivoli\TSM\AgentOBA\sched\dsmsched.log` with the **schedlogname** option in the Data Protection for Oracle options file.

4. If a Tivoli Storage Manager scheduler service is already installed on your workstation for the regular backups of the Windows system, you must install another with a unique name to run the schedules that are defined for Data Protection for Oracle. The Tivoli Storage Manager scheduler service needs a different node name than the regular Tivoli Storage Manager backup archive client. If the path you want to use has a space in it, for example `C:\Program Files\Tivoli\TSM\baclient`, you can place quotation marks around the section of the path name that contains a space `C:\"Program Files"\`. You can also use the short form of the path name. The short form of a path name is made up of

the first six characters in the path, followed by a tilde (~) and the unique identifier. The following is an example of the short form of the path name: `C:\Progr~1\Tivoli\TSM\baclient`

The `orcsched.cmd` file must contain these variables with the following values:

oracle_sid
Specify the Oracle system identifier for the instance to be used in the scheduled backup. A value of `ilr` is used in the example.

ora_exe
Specify the complete path and file name of the Oracle RMAN executable file. A value of `c:\oracle\ora91\bin\rman.exe` is used in the example.

cmdfile
Specify the complete path and file name of the Oracle command file. A value of `C:\rman\bkdb.rmn` is used in the example.

Querying backup objects

Use the **tdposync query** command to query the Tivoli Storage Manager server for information about objects that are backed up.

About this task

When you issue the **tdposync query** command, information about a backup object is displayed. Information is listed including the size and date of the backup, and whether the object is compressed, encrypted, or deduplicated by the Tivoli Storage Manager during the backup operation.

Related tasks:

"Data deduplication with Data Protection for Oracle"

Related reference:

"**Query** command" on page 45

Data deduplication with Data Protection for Oracle

You can use data deduplication with Data Protection for Oracle to reduce the amount of redundant data that is backed up to the Tivoli Storage Manager server.

Overview of data deduplication

Data deduplication is a method of reducing storage needs by eliminating redundant data

Two types of data deduplication are available with Tivoli Storage Manager: client-side data deduplication and server side data deduplication.

Client-side data deduplication is a data deduplication technique that is used on the Tivoli Storage Manager API to remove redundant data during backup processing before the data is transferred to the Tivoli Storage Manager server. Using client-side data deduplication can reduce the amount of data that is sent over a local area network.

Server side data deduplication is a data deduplication technique that is done by the server. The Tivoli Storage Manager server administrator can specify the data deduplication location on either the client or server to use with the **DEDUP** parameter on the **REGISTER NODE**, or **UPDATE NODE** server command.

Setting up for client-side data deduplication

You must edit the client options file before Data Protection for Oracle can use client-side data deduplication through the Tivoli Storage Manager API.

About this task

You can turn on client-side data deduplication by adding `DEDUPLICATION YES` to the `dsm.opt` file and by making sure that the deduplication prerequisites are met.

The Tivoli Storage Manager server administrator must enable data deduplication for the Data Protection for Oracle with the appropriate server command. For example:

```
UPDATE NODE ORACLE_NODE DEDUPLICATION=CLIENTORSERVER
```

The Tivoli Storage Manager server administrator must enable data deduplication on the storage pool where the Oracle data is stored with the following server command:

```
UPDATE STGPOOL BACKUP_POOL DEDUPLICATION=YES
```

Results

After you created backups with client-side data deduplication enabled, you can use the **tdposync query** command to verify that client deduplication occurred during the backup operation. For detailed statistics, you can also query the Tivoli Storage Manager server activity log for the total data reduction.

You can also use the performance monitor feature in the Tivoli Storage Manager server to verify the percentage of data that has been deduplicated. The performance monitor feature is part of the Tivoli Storage Manager Administration Center. The data deduplication statistics are displayed graphically in the Performance GUI in the Administration Center.

Considerations:

- The **deduplication** and **enablelanfree** options are mutually exclusive. Therefore, you can use either one option or the other, but not both options together.
- The **deduplication** and **enableclientencryptkey** options are also mutually exclusive. Therefore, you can use either one option or the other, but not both options together.
- A local deduplication cache is an optimization that can reduce network traffic between the Tivoli Storage Manager server and the client. Client-side data deduplication can occur with or without it. Do not use the deduplication cache with Data Protection for Oracle for the following reasons:
  - The cache cannot be used when multiple processes, such as concurrent backups or Tivoli Storage Manager API applications, transfer content concurrently. Data Protection for Oracle backup operations that use multiple channels use multiple processes.
  - It is possible that the client deduplication cache can become out of sync with the server-deduplicated disk storage pool. This state can be the result of object expiration, file space deletion, and overflow to an associated tape storage pool. When the client cache contains entries that are no longer in the Tivoli Storage Manager server deduplicated pool, the cache is reset and the backup operations fails. The Tivoli Storage Manager API does not attempt the backup again.

- When Tivoli Storage Manager server expiration or a similar process that removes deduplicated data extents runs concurrently with a deduplicated backup, the backup might fail. Backup operations with client-side deduplication enabled fails with the following messages:
  - `Return code=254`
  - Error message: `ANS7899E The client referenced a deduplicated extent that does not exist on the TSM server.`

Related tasks:

"Determining total data reduction"

Related reference:

"**Query** command" on page 45

Determining total data reduction

You can determine the percentage of total data reduction by querying the Tivoli Storage Manager server activity log.

About this task

Look for message number ANU2526I, which displays the data deduplication statistics, as shown in the following example:

```
ANE4991I (Session: 67, Node: HALLEY_ORC)  DP Oracle Win64 ANU0599  TDP for Oracle: (5508): =>()
 ANU2526I Backup details for backup piece \adsmorc\orcnt\df_727444762_116_1 (database "orcl").
 Total bytes processed: 9961472. Deduplicated: Yes. Bytes after deduplication: 2272805.
 Deduplication reduction: 77.18%. Compressed: Yes. Bytes after compression: 52253. Compressed by: 97.70%.
 Encryption: None. LAN-Free: No. Total bytes sent: 52253. Total data reduction: 99.48%.
 Total processing time: 00:00:01. Throughput rate: 9728.00Kb/Sec. (SESSION: 67)
```

In the following example, the Oracle database backup piece size is 9,961,472 bytes. Then, it was deduplicated and the number of bytes after deduplication is 2,272,805.

The total data reduction is calculated as follows:

- The percentage of data that is deduplicated is as follows:

  ```
  Deduplication reduction = (1 - 2272805 / 9961472 ) = 0.7718
  ```

- After data deduplication, the object was compressed. The number of bytes before compression is the number of bytes after deduplication. The data was compressed to 52,253 bytes. Therefore,

  ```
  Compressed by  = (1 - 52253 / 2272805) = 0.9770
  ```

- The total bytes sent to the server equals the number of bytes after compression. The formula for total data reduction is as follows:

  ```
  Total data reduction = (1 - bytes after compression / bytes processed)
  = (1 - 52253 / 9961472) = 0.9948
  ```

Results

If there is no deduplication, the number of bytes after deduplication equals the number of bytes processed. If there is no compression, the number of bytes after compression equals the number of bytes after deduplication.

If you want to find out data reduction across multiple backup pieces, you can add up the numbers and calculate the ratios.

You can also use the performance monitor feature in the Tivoli Storage Manager server to verify the percentage of data that has been deduplicated. The

performance monitor feature is part of the Tivoli Storage Manager Administration Center. The data deduplication statistics are displayed graphically in the Performance GUI in the Administration Center.

Chapter 5. Commands and utilities for Data Protection for Oracle

The Data Protection for Oracle commands and utilities are used to protect Oracle Server data.

tdpoconf and tdposync utilities

Set up and maintain Data Protection for Oracle with the tdpoconf and tdposync utilities. Find the utilities in the directory where Data Protection for Oracle is installed.

Use the Data Protection for Oracle utilities to do the following tasks:

- Set up and maintain Data Protection for Oracle with the tdpoconf utility. The utility is also used for password maintenance.
- Synchronize the RMAN catalog and Oracle control file by using tdposync. The utility is used to delete Oracle backups that are stored on the Tivoli Storage Manager.
- Query objects that are backed up on the Tivoli Storage Manager by using the tdposync utility.

Command line syntax and characteristics

Guidelines for the command line syntax for the Data Protection for Oracle utilities.

The Data Protection for Oracle utilities use the following command line syntax:

```
tdpoconf command 0 or more optional parameters
tdposync command 0 or more optional parameters
```

The command-line parameters have the following characteristics:

- Minimum abbreviations for keywords are indicated in uppercase.
- Optional parameters begin with a dash (-).
- Optional parameters can display in any order.
- Some keyword parameters require a value that is separated by the equal sign (=).
- If a parameter requires more than one value, the values are separated with commas.
- A space separates the invocation from the command and the command from any optional parameters.
- Each parameter is separated from others by a space.
- If a parameter value includes spaces, the entire parameter must be enclosed in double quotation marks.

tdpoconf utility

The tdpoconf utility provides setup tasks for configuring Data Protection for Oracle. The utility uses the tdpo.opt file that is stored in the installation directory to centralize information for setup purposes.

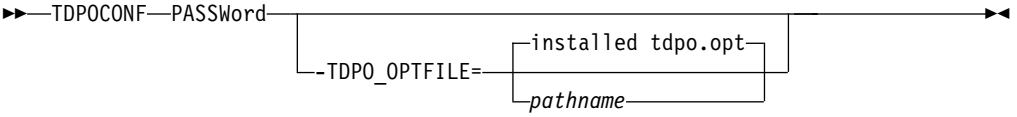
Use the following commands with the tdpoconf utility:

- **PASSWord**
- **SHOWENVironment**

password command

Use the **password** command to create a password or change an existing password on the Tivoli Storage Manager server. You are prompted to enter both the old and new passwords when you use this utility to change the password.

Syntax



Optional parameters

-TDPO_OPTFILE=pathname
This parameter specifies the fully qualified path name to the tdpo.opt file. If you choose not to specify this option, the default path is used.

Example

An output example of the **tdpoconf password** command is provided:

```
************************************************************
*  IBM Tivoli Storage Manager for Databases Utility          *
*  Password file initialization/update program               *
*                                                            *
************************************************************

Please enter current password:

Please enter new password:

Please reenter new password for verification:

ANU0260I Password successfully changed.
```

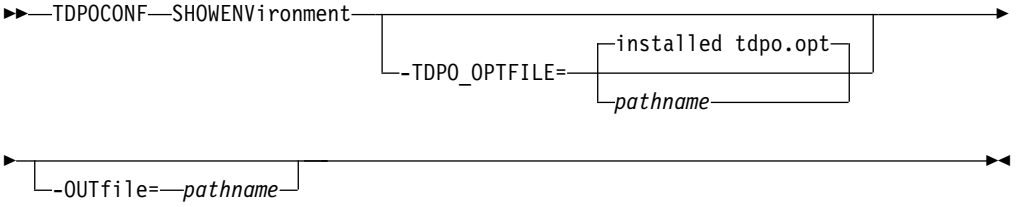
showenvironment command

Use the **showenvironment** command to query the Tivoli Storage Manager server with the options that are set in –TDPO_OPTFILE, the tdpo.opt file in the default installation directory, or the default values set by Data Protection for Oracle.

The screen output displays information about the Tivoli Storage Manager API and Tivoli Storage Manager server. This command is useful if you are troubleshooting setup errors for Data Protection for Oracle. If the password file is not initialized properly, the output of the tdpoconf showenvironment command reports the error.

Tip: To ensure that the environment is set up correctly before you use RMAN, direct the setup output to a file with the –outfile option.

Syntax



Optional parameters

-TDPO_OPTFILE=*pathname*
This parameter specifies the fully qualified path name to the `tdpo.opt` file. The options file is used by the utilities and the Data Protection for Oracle library.

-OUTfile=*pathname*
This parameter specifies the fully qualified path name to the output file. The formatted text of this file is the same content that in the output on screen.

Example

The following example shows the output of the **tdpoconf showenvironment** command:

```
IBM Tivoli Storage Manager for Databases:
Data Protection for Oracle
Version 7, Release 1, Level 3.0
(C) Copyright IBM Corporation 1997, 2015. All rights reserved.


Data Protection for Oracle Information
 Version:              7
 Release:              1
 Level:                3
 Sublevel:             0
 Platform:             64bit TDP Oracle SUN

Tivoli Storage Manager Server Information
 Server Name:          TSMSERVER_ORACLE
 Server Address:       TSMSERVER
 Server Type:          Windows
 Server Port:          1500
 Communication Method: TCP/IP

Session Information
 Node Name:            NODE_oracle
 Node Type:            TDP Oracle SUN
 DSMI_DIR:             /opt/tivoli/tsm/client/api/bin64
 DSMI_ORC_CONFIG:      /opt/tivoli/tsm/client/oracle/bin64/dsm.opt
 TDPO_OPTFILE:         /opt/tivoli/tsm/client/oracle/bin64/tdpo.opt
 Password Directory:   /opt/tivoli/tsm/client/oracle/bin64
 Compression:          FALSE
 License Information:  License file exists and contains valid license data.
```

tdposync utility

The **tdposync** utility checks for items on the Tivoli Storage Manager server that are not in the RMAN catalog or Oracle control file. With this utility, you can repair these discrepancies by removing unwanted objects from the Tivoli Storage Manager, and reclaim space on the server.

Attention: Deleted files and inactive files cannot be restored. When you are using this utility to delete files, ensure that you do not log in to the wrong node name. You might query a different database than intended, and delete files in error. Ensure that the node name in the PICK window is the one you need. See "Optional parameters" on page 42 and "PICK window" on page 44 for further details.

When you run an RMAN deletion script, entries are deleted in the RMAN recovery catalog or Oracle control file before confirmation from the Tivoli Storage Manager server. In cases where objects are not found on the Tivoli Storage Manager server, RMAN tries to delete backup sets from the Tivoli Storage Manager server and fails. However, the entries in the RMAN catalog or control file for these objects are still removed. When they are deleted, RMAN can no longer identify these backups through the catalog or control file even though the file exists on the Tivoli Storage Manager server. This utility therefore synchronizes the contents of the servers.

When the RMAN catalog or control file contains backups that are marked as expired, RMAN still considers these objects as existing. If you run the **tdposync** utility against these objects, it recognizes these objects in the RMAN catalog or control file and on the Tivoli Storage Manager server and considers them to be in sync. Therefore, you must delete these objects from the RMAN catalog or control file for them to be deleted from the Tivoli Storage Manager server. Use the Oracle **crosscheck** command to verify whether the backups exist. Then, use the Oracle **delete expired** command to remove their record from the RMAN catalog or control file.

When you start **tdposync**, the following processing takes place:

1. Prompts you for the RMAN catalog owner ID or the Oracle database user name, password, and connect string.
2. Gathers information for the Oracle servers.
3. Queries the Oracle backup catalog and the Tivoli Storage Manager server.
4. Displays a list of files that exist on the Tivoli Storage Manager server but not in the RMAN catalog or Oracle control file.
5. Prompts you to take one of the following actions:
   - Delete any files found causing the discrepancy.
   - Delete all files.
   - Exit the program without deleting files from the Tivoli Storage Manager server.

tdposync considerations

To run the tdposync utility successfully, resynchronize the Oracle catalogs with the target databases. If you are using multiple Oracle catalogs, use the **numcatalogs** parameter. Each Oracle database must be backed up to the Tivoli Storage Manager server.

The following information must be considered before you use the **tdposync** command:

- Resynchronize Oracle catalogs with the target databases before you run the **tdposync syncdb** command. First, connect to the target database and the catalog database. The following is an example:

  ```
  $ rman target xxx/yyy@targetdb  rcvcat xxx/yyy@catalogdb
  ```

  When you are connected to both databases, type `resync catalog` at the RMAN prompt.
- By default, Data Protection for Oracle prompts you to synchronize with one Oracle catalog at a time. If you use multiple Oracle catalogs to back up multiple target databases to the same file space, the same node name, and the same owner name on the same Tivoli Storage Manager server, you must use **–numcatalogs**=*number*. This action is necessary so that **tdposync** has all the information to correctly query both Oracle and the Tivoli Storage Manager.

  Similarly, if you use Oracle control files to back up multiple target databases to the same file space, the same node name, and the same owner name on the same, you must use **-numorinstances**=*number*.

  If, for example, you back up only one target database by using two catalogs, do not specify this option. However, if you back up two target databases by using two catalogs, one catalog for each, to the same under the same file space, node name, and owner name, you must specify **numcatalogs**. If you fail to provide information for the second target database by not specifying two catalogs, that database is displayed as eligible for deletion.

  Restriction: Failure to provide all pertinent and correct information can result in erroneous output. To prevent the erroneous output, see the next consideration.
- If you have more than one Oracle database, back up each Oracle target database to its own file space on the Tivoli Storage Manager server. To back up each Oracle target database to its own file space, use the `tdpo_fs` option in the `tdpo.opt` file. For best results, use a separate Data Protection for Oracle options file for each database that you back up to Tivoli Storage Manager. In this way, it is only necessary to synchronize one catalog at a time, one for each target database. The possibility of showing wrong information in the PICK window is minimized.

  Tip: Make sure to use the same `tdpo.opt` file that was used for the original backup.
- If the information for **sqlplus** that you provide to tdposync is incorrect, such as logon, password, or connect string information, **sqlplus** stops at its logon screen. You must log on again at the prompt by using the RMAN catalog owner ID, password, and connect string. For example:

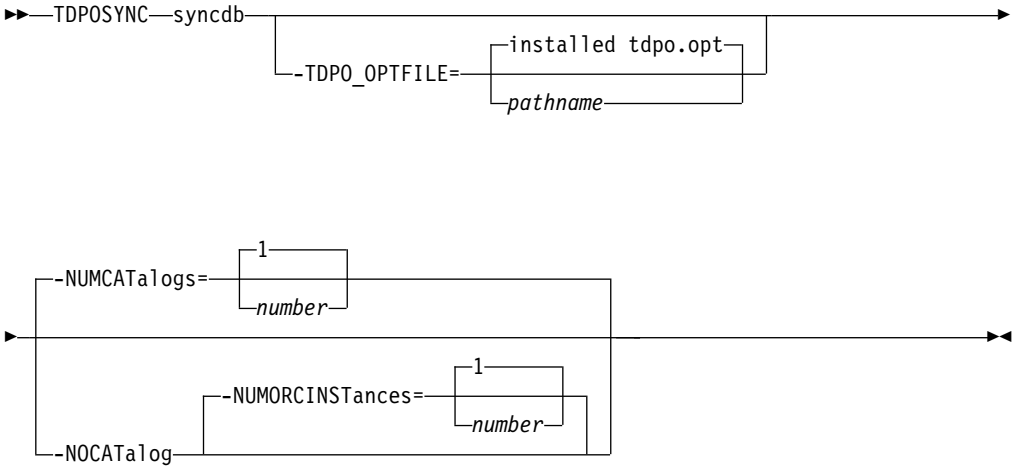
  ```
  login/password@connectstring
  ```

  where `connectstring` represents the Oracle database in which to connect. The `connectstring` is also sometimes referred to as the Transparent Network Substrate (TNS) alias. When the correct input is entered, **tdposync** proceeds.

syncdb command

The **syncdb** command synchronizes Oracle catalog databases or the Oracle control file with the Tivoli Storage Manager server.

Syntax



Optional parameters

-TDPO_OPTFILE=*pathname*

This parameter specifies the fully qualified path name to the `tdpo.opt` file. This file is the options file that is used by the utilities and the Data Protection for Oracle library. This file contains the information for the Tivoli Storage Manager server name and address that **tdposync** needs for synchronizing.

Note: For **syncdb TDPO_OPTFILE**, you must specify the same options file values that were used to do the original backup operations.

-NUMCATalogs=*number*

This parameter specifies the number of Oracle catalog databases that you want to synchronize and prompts you for information for each catalog.

Specify this option only when you use multiple Oracle catalogs to back up multiple target databases to the same Tivoli Storage Manager server under the same file space, node name, and owner name.

According to the number you specify for **-numcatalogs**, you are prompted for the user name, password, and connect string for each. If you do not specify **-numcatalogs**, the default is 1, and you are prompted only once.

You are prompted for start and end dates for your query. Then you are prompted for the following information for each catalog:

- `Catalog # User Name:`
- `Catalog # Password:`
- `Catalog # Connect String:`

You are also prompted for the following date information to narrow your search:

- From Date: `MM/DD/YYYY`
- To Date: `MM/DD/YYYY`

If no dates are specified, Data Protection for Oracle displays all objects that are not in sync.

-NOCATalog
This parameter specifies that the **tdposync** utility uses the backup history information that is stored in the Oracle control file rather than a catalog database to reconcile the Tivoli Storage Manager database with the RMAN backup history.

-NUMORCINSTances=*number*

This parameter specifies the number of Oracle instances that you want to synchronize and prompts you for information for each instance.

Specify this option only when you use multiple Oracle instances to back up multiple target databases to the same Tivoli Storage Manager server under the same file space, node name, and owner name.

According to the number you specify for **-numorcinstances**, you are prompted for the user name, password, and connect string for each instance. If you do not specify a value for **-numorcinstances**, the default is 1, and you are prompted only once.

For each Oracle instance, the following information is requested:

- `Oracle Database # User Name`
- `Oracle Database # Password`
- `Oracle Database # Connect String`

You are also prompted for the following date information to narrow your search:

- From Date: `MM/DD/YYYY`
- To Date: `MM/DD/YYYY`

If no dates are specified, Data Protection for Oracle shows all objects that are not in sync.

Example

Synchronize the Tivoli Storage Manager database with the RMAN backup history and the Oracle control file using the **tdposync syncdb** command. The following output is displayed:

```
Command: TDPOSYNC syncdb -nocatalog -numorcinstances=2

Output:
IBM Tivoli Storage Manager for Databases:
Data Protection for Oracle
Version 7, Release 1, Level 0.0
(C) Copyright IBM Corporation 1997, 2013. All rights reserved.
From Date (01/01/1990): 01/01/2013
To Date (01/05/2013): 12/12/2013

Oracle Database 1 User Name: OrcUser1
Oracle database 1 Password: OrcUser1pw
Oracle database 1 Connect String: Oracle_DB_A

Oracle Database 2 User Name: OrcYser2
Oracle database 2 Password: OrcUser2pw
Oracle database 2 Connect String: Oracle_DB_B
```

When you specify the **syncdb -numcatalogs** parameter, you are prompted for input for each catalog on the node. This example assumes two separate RMAN catalogs, rman and rman2:

```
C:\Tivoli\Tsm\AgentOba>tdposync syncdb -numcatalogs=2 -TDPO_OPTFILE=c:\RMAN\
scripts\tdpo.opt

Output:
IBM Tivoli Storage Manager for Databases:
Data Protection for Oracle
Version 7, Release 1, Level 1.0
(C) Copyright IBM Corporation 1997, 2014. All rights reserved.

From Date (01/01/1990): 01/01/2014
To Date (01/05/2014): 12/12/2014

Catalog 1 User Name: rman
Catalog 1 Password: rman
Catalog 1 Connect String: rman


Catalog 2 User Name: rman2
Catalog 2 Password: rman2
Catalog 2 Connect String: rman2
```

Note: From Date implicitly searches from time=00:00:01 and **To Date** implicitly searches to time=23:59:59 of the same day.

PICK window:

The PICK window provides information to help you decide if the files that are displayed are out of synchronization with the Oracle catalog or control file.

The following information is provided:

- The node with which you are querying the Tivoli Storage Manager server
- The date of the file backup
- The size of the backup
- The backup name \hl\orcnt\ll

Attention: Use caution when you are selecting files for deletion. If you are unsure that the files in question are out of synchronization, do further research before you delete them. Deleted files cannot be restored.

Example

The PICK window shows the node names, and names the files that are backed up. The following example shows the output that is displayed for a node called AGENT_NODE:

```
Synchronize utility PICK Window
  Node Name:            AGENT_NODE

     Backup Date                 Size        Backup Name
-------------------------------------------------------------------------
1. | 01/09/2014  09:19:59        50.35MB     \adsmorc\orcnt\1kc2cnfv_1_1
2. | 01/02/2014  11:36:20       427.08MB     \adsmorc\orcnt\4kc3cnfv_1_1
3. | 01/02/2014  07:14:30       508.00MB     \adsmorc\orcnt\4qcgdhfr_1_1
4. | 01/02/2014  07:21:38       763.94MB     \adsmorc\orcnt\4ocf8999_1_1
5. | 01/09/2014  11:00:11        69.12MB     \adsmorc\orcnt\4ocf8999_1_2
6. | 01/09/2014  11:00:12       950.09MB     \adsmorc\orcnt\4ocf8999_1_3
7. | 01/09/2014  11:00:13       656.69MB     \adsmorc\orcnt\4rch25jk_1_1
8. | 01/09/2014  11:00:14       135.36MB     \adsmorc\orcnt\4rch25jk_1_2
9. | 01/09/2014  11:00:15       298.01MB     \adsmorc\orcnt\4rch25jk_1_30
   |
   |
   |
0---------10--------20--------30--------40--------50--------60--------70
<U>=Up  <D>=Down  <T>=Top  <B>=Bottom  <R#>=Right  <L#>=Left
<G#>=Goto Line #  <#>=Toggle Entry  <+>=Select Al<->=Deselect All
<#:#+>=Select A Range <#:#->=Deselect A Range  <O>=Ok  <C>=Cancel
pick>
```

Files that are selected for deletion are marked by a plus (+). To delete selected files:

1. Enter **OK** at the PICK prompt.

   A warning message is shown confirming the deletion of the selected files.
2. Enter **Yes** to delete the selected files from the Tivoli Storage Manager server.

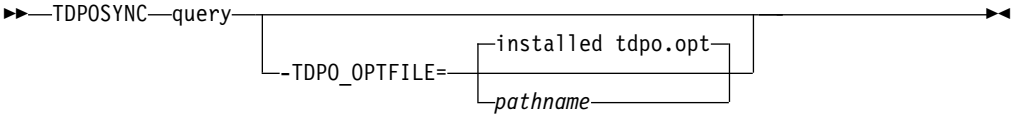
`Query` command

Use this command to query the Tivoli Storage Manager server for information about objects that are backed up. You can obtain information such as whether an object is compressed, encrypted, or deduplicated by the client during a backup operation.

The **query** command uses the options that are set in the **-TDPO_OPTFILE** parameter, the `tdpo.opt` file in the default installation directory, or the default values set by Data Protection for Oracle to query the Tivoli Storage Manager server.

When you issue the **tdposync query** command, you are prompted to enter date range for the query. The screen output displays information about the objects that were backed up to the Tivoli Storage Manager server between the start and end dates that you specified.

Syntax



Optional parameters

-TDPO_OPTFILE *=pathname*

This parameter specifies the fully qualified path name to the `tdpo.opt` file. This file is the options file that is used by the utilities and the Data Protection for Oracle library. The file contains the information for the Tivoli Storage Manager server and the server address that **tdposync** command must use for synchronizing.

When you specify the **query TDPO_OPTFILE** command, you must specify the same options file values that were used for the original backup operations. If you do not specify the **TDPO_OPTFILE** path, the default value in the default Oracle installation path (`/Program Files/Tivoli/TSM/AgentOBA64/tdpo.opt`) is used.

Description of the output fields

Name Object name on the Tivoli Storage Manager server; for instance, `/fs/hl/ll`.

Owner
The name of the user who backed up the object.

Size The size of the object size on the Tivoli Storage Manager server.

Creation Date / Time
The date and time the object was backed up.

Compressed
Lists whether an object was compressed during the backup operation.

Encryption Type
Lists the type of encryption that was used during the backup operation. The possible values are as follows:

None The object was not encrypted.

AES-128
The object was encrypted by using AES-128 encryption.

DES-56
The object was encrypted by using DES-56 encryption.

Client-deduplicated
Lists whether an object underwent client-side data deduplication.

Examples

Use the `tdposync query` command to find information about backed up objects, encryption type and data deduplication.

Query the Tivoli Storage Manager server for information about objects that are backed up
The command to be run is `tdposync query`.

The following output is displayed:

```
IBM Tivoli Storage Manager for Databases:
Data Protection for Oracle
Version 7, Release 1, Level 1.0
(C) Copyright IBM Corporation 1997, 2014. All rights reserved.

From Date (01/01/2014):

To Date (07/02/2014):

Backup Object Information
------------------------

Name ............................. \adsmorc\orcnt\df_722435657_35_1
Owner.............................
Size ............................. 2,010 KB
Creation Date / Time .............. 07/02/2014 10:08:20
Compressed ........................ Yes
Encryption Type ................... None
Client-deduplicated ............... No

Backup Object Information
------------------------

...
```

Finding the encryption type

When you issue the **tdposync query** command, the entire list of backup object information is printed to the command prompt window without page separators, scrolling, or canceling capability. Redirect the output of the query to a file and find out the encryption type that was used for the backups from the previous week.

Command: `echo from_date > in.txt & echo to_date >> in.txt & tdposync query < in.txt > out.txt`

Open the file `out.txt` with a text editor and search for `Encryption Type` to determine the type of encryption that was used.

Finding data deduplication information

Determine the data deduplication reduction for a particular node by querying the Tivoli Storage Manager server activity log for the ANU2526I message.

Appendix. Accessibility features for the Tivoli Storage Manager product family

Accessibility features help users who have a disability, such as restricted mobility or limited vision to use information technology products successfully.

Accessibility features

The IBM Tivoli Storage Manager family of products includes the following accessibility features:

- Keyboard-only operation using standard operating-system conventions
- Interfaces that support assistive technology such as screen readers

The command-line interfaces of all products in the product family are accessible.

Tivoli Storage Manager Operations Center provides the following additional accessibility features when you use it with a Mozilla Firefox browser on a Microsoft Windows system:

- Screen magnifiers and content zooming
- High contrast mode

The Operations Center and the Tivoli Storage Manager server can be installed in console mode, which is accessible.

The Operations Center help system is enabled for accessibility. For more information, click the question mark icon on the help system menu bar.

Vendor software

The Tivoli Storage Manager product family includes certain vendor software that is not covered under the IBM license agreement. IBM makes no representation about the accessibility features of these products. Contact the vendor for the accessibility information about its products.

IBM and accessibility

See the IBM Human Ability and Accessibility Center (http://www.ibm.com/able) for information about the commitment that IBM has to accessibility.

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Glossary

A glossary is available with terms and definitions for the IBM Tivoli Storage Manager family of products.

See Tivoli Storage Manager glossary (http://www.ibm.com/support/knowledgecenter/SSGSG7_7.1.3/tsm/glossary.html).

To view glossaries for other IBM products, see http://www.ibm.com/software/globalization/terminology/.

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